

AMENDMENTS TO THE AMENDED PAGES OF SPECIFICATION

Please insert the following heading and paragraph at page 1, after the title:

Priority Claim

This is a 35 U.S.C. §371 National Stage of International Application No. PCT/EP2003/010066, filed on September 10, 2003. Priority is claimed on that application and on the following application:

Country: Germany, Application No. 102 61 979.4, Filed: September 10, 2002

Background of the Invention

Please replace the paragraph beginning at page 1, lines 2-13, with the following rewritten paragraph:

The invention concerns a method for operating an internal combustion engine, especially an internal combustion engine for a motor vehicle, with a charge air flow path, in which a compressor, an exhaust gas turbocharger, a waste gate, which admits a flow of exhaust gas to a turbine of the exhaust gas turbocharger, and a throttle valve are installed, ~~wherein an~~ An outlet of the compressor is connected with an inlet of the exhaust gas turbocharger ~~[[, an]]~~ [[, an]]. An air channel that bypasses the compressor is provided, and the throttle valve is installed downstream of the exhaust gas turbocharger, ~~wherein a~~ A compression throttle valve, which is installed in the air channel that bypasses the compressor, selectively closes exclusively this air channel that bypasses the compressor in a continuously variable way and controls compression of the compressor, ~~and wherein, in~~ In an engine load or speed range in which the exhaust gas turbocharger alone is not able to apply the desired boost pressure, the compressor is switched on, ~~in accordance with the introductory clause of Claim 1.~~

Please replace the paragraph beginning at page 2, line 19 to page 3, line 2, with the following rewritten paragraph:

US Patent No. 4,903,488 discloses an internal combustion engine with a charge air flow path, in which a compressor, an exhaust gas turbocharger, and a throttle valve are installed, wherein an outlet of the compressor is connected with an inlet of the exhaust gas turbocharger, and the throttle valve is installed downstream of the exhaust gas turbocharger. A compression throttle valve, which is installed in an air channel that bypasses the compressor, selectively closes exclusively this air channel that bypasses the compressor.

Please replace the paragraph beginning at page 3, lines 3-12, with the following rewritten paragraph:

US Patent No. 6,205,787 discloses a charge air system for an internal combustion engine with a compressor and with an exhaust gas turbocharger, which is additionally provided with an electric motor. To accelerate the internal combustion engine, the charge air compression can be temporarily increased, even at low speeds of the internal combustion engine, by means of the electric motor in the exhaust gas turbocharger. However, as soon as the exhaust gas turbocharger produces a sufficient boost pressure, the electric motor and the compressor are shut off. During an acceleration phase or even at high engine speeds and loads, this boost function of the exhaust gas turbocharger can be used simultaneously with the compressor. A check valve in an air conduit that bypasses the compressor prevents throttling of the exhaust gas turbocharger in every operating situation.

Please insert the following heading at page 3, between lines 12-13:

Summary of the Invention

Please delete the paragraph beginning at page 3, lines 15-17.

Please insert the following heading at page 4, between lines 7-8:

Brief Description of the Drawings

Please replace the paragraph beginning at page 4, lines 8-11, with the following rewritten paragraph:

Additional features, advantages and advantageous refinements of the invention are ~~specified in the dependent claims and are~~ explained in the following description of the invention with reference to the attached drawing. The sole figure is a schematic representation of the air path and the exhaust gas end of a twin supercharged internal combustion engine.

Please insert the following heading at page 4, between lines 11-12:

Detailed Description of the Invention

Please replace the paragraph beginning at page 4, line 12 to page 5, line 5, with the following rewritten paragraph:

As the sole figure shows, the internal combustion engine comprises an air path, in which the following are installed: an air filter 10, a compressor 12, an air channel 14 that bypasses the compressor 12, a compression throttle valve 16 for selectively closing the air channel 14, an exhaust gas turbocharger 18, a supercharger intercooler 20, a throttle valve 22, and an intake manifold 24, which opens into the several combustion chambers in a cylinder crankcase 26 of the internal combustion engine. A waste gate 30, which admits a flow of exhaust gas to a turbine 32 of the exhaust gas turbocharger 18, is installed on the exhaust manifold 28. The exhaust gas turbocharger 18 also includes a compressor 33. An outlet of the compressor 12 opens into an inlet of the exhaust gas turbocharger 18. The compressor 12 is driven by a belt 34 from the crankshaft of the internal combustion engine. In this regard, the drive of the compressor 12 can be selectively disengaged from the crankshaft by means of a clutch 36, for example, a magnetic

clutch. The concept of this system is to realize supercharging by the compressor 12 in a low engine speed range and to shut off the compressor 12 starting at a certain engine speed, above which the exhaust gas turbocharger 18 guarantees sufficient supercharging. Sensors 38, 40, 42, and 44 measure, respectively, a pressure p_{vATL} before the exhaust gas turbocharger 18, a pressure p_{vDK} before the throttle valve 22, a pressure p_s in the intake manifold 24, and an ambient pressure p_u .

Please replace the paragraph beginning at page 5, lines 6-22, with the following rewritten paragraph:

In the engine load or speed range in which the exhaust gas turbocharger 18 alone is not able to apply the desired boost pressure, the compressor 12 is switched on. Its compression is controlled by the compression throttle valve 16. In this range, the waste gate 30 adjusts to maximum compression of the exhaust gas turbocharger 18. In this regard, the throttle valve 22 acts as the control element of the intake manifold pressure p_s . The positions of the two valves 16 and 22 are computed in the above-described mass flow model by reverse computation and controlled in a coordinated way. As soon as the mass flow that the exhaust gas turbocharger 18 is able to deliver on the basis of the exhaust gas mass flow \dot{m}_{abg} exceeds the delivery volume of the compressor 12 or as soon as the desired boost pressure can be adjusted by the exhaust gas turbocharger 18 alone, the compressor 12 is shut off. The compression throttle valve 16 is fully opened so as not to throttle the exhaust gas turbocharger 18. The compression of the exhaust gas turbocharger 18 is regulated from this point on by the position of the waste gate valve 30. When the internal combustion engine is running at full load, the throttle valve 22 is completely open, the compressor 12 is coupled, and the compression throttle valve 16 is completely closed. As soon as the exhaust gas turbocharger 18 begins to exhaust the volume after the compressor 12, the waste gate control takes over the adjustment of the desired charge until the desired charge has been reached. Up until this point, the throttle valve 22 is completely open.